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AMERICAN INSTITUTE OF CROP ECOLOGY

Silver Spring, Maryland

THE USE OF PHENOLOGY IN ASCERTAINING THE TEMPERATURE REQUIREMENTS OF CITRUS FRUIT

(Tabular Material - Part I)

Based on Some Data From A Number of Citrus-Growing Countries

Contract No. DA 18-064-AMC-127(A)



April, 1965

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3	Boufarik, Algeria
.5 '4	Berri, South Australia
5	Sidney, N.S.W., Australia
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-	Locations:
7	Setubal, Portugal
8	Boufarik, Algeria
9 10	Griffith, N.S.W., Australia Sao Paulo, Campinas, Brazil
11	Urundel and Tabacal Citrus Areas, Argentina
12	Ledesma and Calilegua Citrus Areas, Argentina
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0.1	Clementine Varieties) Grown at the following Locations:
21	Setubal, Portugal
22	San-Giuliano, Corsica, France
23	Valencia, Spain
24	Boufarik, Algeria
25	Taranto, Italy Catania, Sicily, Italy
26 27	Messina, Sicily, Italy
27 28	Rehovot, Coastal Plain, Israel
28 29	Tunis, Tunisia
30	Tripoli, Libya
31	Concordia Citrus Area, Argentina
J 1	concern offen with wedaring

Mean Monthly Temperature Data, Utilized in Conjunction with the Citrus Phenology Records, for the following Stations:

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32
          Setubal, Portugal
33
          Taranto, Italy
34
          Valencia, Spain
35
          San-Giuliano, Corsica, France
36
          Berri, South Australia
36
          Griffith, N.S.W., Australia
37
          Boufarik, Algeria
38
          Sidi Mesri, Tripoli, Libya
39
          Citrusdal, Western Cape Province, South Africa
40
          Candia, Island of Crete, Greece
41
          Salta, Argentina
42
          Lod, Israel
43
          Siracuse, Sicily, Italy
43
          Messina, Sicily, Italy
43
          Tunis, Tunisia
44
          Sidney, N.S.W., Australia
44
          Sao Paulo, Brazil
          Salto, Uruguay
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^{*} Phenological records and the day-degree summation requirements of the relevant varieties of citrus grown in the various citrus areas of the United States, as well as the comparison of these requirements with those of the same varieties grown in other countries, is to be presented in Part II of this report should the continuation of this investigation be made possible.

TABLE A YEAR-ROUND GLOBAL CLIMATIC ANALOGUES OF THE CITRUS AREAS OF THE UNITED STATES

Country Country Region Province Latitude Accountry Region Accountry Region Accountry Region Accountry Accountry Region Accountry Region Accountry Region Accountry Accountry Region Accountry														-	ANNIAT	IAT.		
California Southern Constent Consten									ы	ERA	UR		•		RE1A1	TVE	PR	PRECIPITATION
California Country C	STATION	COUNTRY	Region	PROVINCE	Latitude	•	MNUAL	_	WARME	ST MON	H	9	LEST M	ONTH	HUMI	ITY		
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California Southern Souther		U.S.)	Country			Tean.		NIGHE	rean con	va.	NIBUL	e e			riegi.	Jul.	Tachor	Occurrence
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	Chico	Celifornia			39°42'N	61	89	*	79	88	20	77	67	9	17	45	27	Fall-Winter
	Arles	France	Southern	Bouches du Rhone	N,07,07	85 G	G 3	5.5	76	8 %	69 17	45 7	9 7	30	n.a.	n.a. 64	73.6	Fall-Winter
Castle Castle Castle Southern Macedonia 19°71'N 62 69 55 77 80 77 70 45 46 40 77 70 45 40 40 77 70 45 40 40 77 70 45 40 40 77 70 45 40 40 77 70 45 40 40 77 70 45 40 40 77 70 40 40 40 40 40 40 40 40 40 40 40 40 40	Alexandroupolis		שמנושפשובנש	*0142	N 10 0*	3	5		?	5	2	! 	}	;	3	3	}	
California Southern Extremadura 39°26'N 61 65 56 78 68 71 47 54 64 54 54 54 54 54 54 54 54 54 54 54 54 54	Willows	California			N,18,66	62	69	55	79	87	2 :	45	49	70	71	45	8 9	Fall-Winter
California California Cautionia Southern Croatia 19°726'N 60 64 57 78 88 70 45 48 42 60	Thessaloniki Badajoz	Greece	Northern Southwestern	Macedonia Estremadura	N. 75, 88	1 7	67	2 %	2 8 8	£ 8	22	4 4	51	4 4 40	0 9	2 0	17	Fall Winter
California Southern Apulia 17.06 M 62 68 55 78 88 69 45 49 40 10	Oroville	California		, i	39°26'N	62	8 2	55	80	88	70	45	67	41	7.1	45	30	Fall-Winter
California Southern Southern Apolia 199726'N 62 66 55 77 8 88 69 45 50 41 70 70 70 70 70 70 70 70 70 70 70 70 70	317de		7131634			3	;		:	}		!	!	!	}	}	}	
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California Southern Constantine 35°22'N 62 70 55 80 90 71 45 50 40 60 Algeria Morthern Constantine 35°22'N 60 65 55 80 80 71 43 47 39 53 Tunisia Western 34°22'N 66 73 60 86 93 76 47 52 42 55 ra California Gentral Santiago 34°25'N 66 73 60 86 94 73 62 73 44 50 46 55 52 69 77 61 48 53 44 50 44 50 86 94 78 44 50 39 42 50 40 60 66 73 60 65 52 69 77 61 48 53 42 66 77 64 53 40	Constantine	Algeria		Constantine	36°22'N	8	99	25	78	82	11	77	8 ₇	41	99	22	50	Winter
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California Central Santiago 33°226°N 60 66 54 67 73 62 52 58 46 74 66 54 67 77 61 48 53 46 74 66 54 67 77 61 48 53 42 66 66 54 67 77 61 61 48 53 42 66 66 54 67 77 61 61 48 53 42 66 66 73 60 77 61 77 61 77 61 77 61 77 61 77 61 77 61 77 61 77 61 77 61 77 61 67 67 67 67 67 67 67 67 67 67 67 67 67	Gafea Ruthe	Tunisia Iraq	Southern Western		34°25'N 33°02'N	9 %	22	9 65	8 8 8 8	8 33	78	7 7 7 7 7 7 8 7 1	 20 20	39	26 42	41 27	9 4	Winter Fall-Winter
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TABLE A

YEAR-ROUND GLOBAL CLIMATIC ANALOGUES OF THE CITRUS AREAS OF THE UNITED STATES (continued)

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Colifornia Continua Continu		U.S.)	Country			Mean	Day	Night	Mean			Mea				•	Amount	Occurrence
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Material Australia Succession Verticoria State Sta	Riverside	California			33°58'N	63	17	55	76	8	· •	-		77	5	7.7	13	Fall-Winter
South Autralia Southwestern So	Swan Hill	Australia	Western Vic.	Victoria	35°22'S	62	89	55	74	82	2.59	787		77	9	77	13	Fall-Winter
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National Noteton Notthwestern Natheria National Notthwestern National Nat	Montagu	South Africa	Southern	Cape Province	33°47'S	3	70	52	75	85	89	25		7 7	9.6	5 6	12	Fall-Winter
Southern Southern	Berrechid	Horocco	Morthwestern		33°18'N	ż	11	99	76	85	89	52		45	89	84	15	Fall-Winter
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Piorida Australia Southwestern Greensland 28°33'N 72 76 67 82 86 78 66 55 73 71 66 55 77 66 57 77 66 82 87 77 66 57 77 66 82 87 77 66 82 87 77 66 82 87 77 66 57 77 66 82 87 77 66 57 77 66 82 87 77 66 57 77 66 82 87 77 66 57 77 66 57 77 66 57 77 66 57 77 66 57 77 66 57 77 66 57 77 66 57 77 66 77 66 78 77 66 77 66 77 66 78 78 78 78 78 78 78	Emerald	Australia	Central Qus.	Queens land	23°28'S	72	78	- 69	83	68	77	58	65	52	59	39	23.2	Spring-Summer
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Argentina Mortheastern Corrientes 27°28's 72 77 66 82 87 77 66 50 77 66 57 73 51 53 51 73 51 50 50 77 77 66 82 88 77 66 67 58 66 54 66 54 66 54 66 54 66 54 66 70 62 77 73 61 80 81 86 78 66 70 62 76 61 81 84 76 68 80 64 68 54 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 60 76 76 60 76 60 77 76 60 83 77	Lake Alfred	Plorida			N, 90° 80	73	- a	- 23	6	0		5		`	ŕ	ï		
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Florida Paraguay Southwestern Australia 27°25'N 74 78 70 82 86 78 65 70 62 76 61 Plorida Australia Eastern Que. Queensland 25°30'N 74 79 68 81 86 76 66 72 60 76 60	Asuncion	Paraguay	Southwestern		25°17'S	7.	80	**	83	89	11	62	29	28.5	1 8	Z Z	25	Spring-Summer
ubit Peraguay Southwestern 24°27'S 74 78 71 83 86 80 64 68 60 73 62 Florida Australia Eastern Qns. Queensland 21°09'S 72 76 69 80 83 77 62 67 57 79 n.a.	Fort Pierce	Florida			27°25'N	7.4	- 82	02	82	98	- 82	9	7.0	ç	76	- 5	7	Common Pall
Florida Lestern Qns. Queensland 21°09'S 72 76 69 80 83 77 62 67 57 79 n.a.	Itacurubi	Paraguay	Southwestern		5,16,76	7/2	78		2	78	2 0	33	2 9	3 5	2 6	3 3	ξ:	TTRJ- James
Florida Lastern Qns. Queensland 21°09'S 72 76 69 80 83 77 62 67 57 79 6.0 6.0		•			;	:	?	:	3	8	8		8	3	5	70	<u>``</u>	Spring-Summer
Australia Lastern Uns. Queensland 21.09'S 72 76 69 80 83 77 62 67 57 79 n.a.	Homestead	Florida	;	•	25°30'N	74	62	89	81	98	9/	99	72	9	9/	9	3	Summer-Fall
		PILE LIST	Eastern Cas.	Queens land	21.09.S	72	9/	69	8	83	77	62	29	57	79	п.а.	63	Summer
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TABLE B

YEAR-ROUND GLOBAL THERMAL ANALOGUES OF THE CITRUS AREAS OF THE UNITED STATES

								TEMP	PERA	TURE				ANNUAL RELATIVE	JAL FIVE
STATION	COUNTRY	Region	PROVINCE	Latitude		ANNUAL		MA	WARMEST MONTH	HONTH	000	CUOLEST MONTH	ONTH	HUMIDITY	ITY
	(State of	Country			X G	Mean	Mean	- A	Mean	n Mean	2	, <u>2,</u>		1	Daily
					P.	, F	e i	F		┸~	F	E P	N 1 Kill C	Zean	72 ×
Lemon Cove	California			36°23'N	75	11	26	-8		73	7	51	41	25	36
Ashur-ade Demescus	U.S.S.R. Syria	Central Asia Southwestern	Turkmen	36°54'N 33°30'N	33	n.a. 70	n.a. 57	82	n.a 2	. n.a.	977	n.a. 49	n.a. 40	n.a. 48	n.a. 36
Bekersfield Adans	California Turkey	Southern		35°25'N 36°59'N	99	72	80 90	 8 8 83	93	76	87 7.7	53	45 43	52 57	36
Santa Berbara Esperance	Celifornia Australia	Southern W.A.	Western Australia	34°26'N 33°50'S	60 61	9 79	57 55	69	73	64 6	25 25	58 88	67 97	74	99
Westwood (U.C.L.A.) Jervis Bay Cape Maturaliste Eyre Port Elizabeth D. F. Melan	California Australia Australia Australia South Africa South Africa	Southeastern M.S.W. Southwestern W.A. Southwestern W.A. Southern	Mew South Wales Western Australia Western Australia Cape Province	34.04'N 35.05'S 33.32'S 32.14'S 33.59'S	62 62 63 63	67 65 66 67 67	58 57 57 57	69 68 70 70 70	4 2 2 3 3 2 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	64 65 65 65 65 65	5,	58 59 62 59	51 53 48 50 49	71 72 72 66 72 72	60 67 66 n.a.
Santa Ana Montevideo	California Uruguay	Southern		33°46'N 34°52'S	62 61	69	55	72	79	65	52	8 4	45	1,2	60
Riverside Rosario Jerusalem	Celifornia Argentina Israel	Eastern Eastern	Entre Rios	33°58'N 32°58'S 31°47'N	282	71 69 68	588	76	833	66 70 70	51 50 48	52 28	7 9 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	56 53 53	47 54 45
El Cajon Katanning Balladonia	California Australia Australia	Southwestern W.A. Southern W.A.	Western Australia Western Australia	32 '47'N 33 '42'S 32 '28'S	62 63	0,90	55 55 56 55 56		81 78 80	99 64 65	50 52 52	52 52 82	797 94 94	65 67 61	n.8. 51 43
Yume Citrus Station Peshavar	Arizona Pakistan	Northern	West Pakistan	32°37'N 34°01'N	72	80 79	4. 20	92	66	78 8	52	60 57	9 7 7 8	28 32	19 38
Weslaco La Paz Lungchow	Texas Mexico Chine	Western Southern	Baja California Kwangsi	26°39'N 24°10'N 22°22'N	72 72 74 74	80 79 77	600	85 84 84	0.088	79 80 80		67 68 62	57 61 54	70 78 83	n.a. 73 75
Orlando Port Said Dibrugarh Monterrey Taipei	Florida Egypt India Mexico Taiwan	Morthern Mortheastern Morthern Morthern	Assam Nuevo Leon	28 33 'N 31 °16 'N 27 °28 'N 25 °40 'N 25 °02 'N	72 71 73 71 72 72	76 77 76 76	68 69 66 68	885 887 887 887	86 84 87 88	78 79 77 80	0 8 0 8 6 8 0 8 6	66 62 66 61 62	55 55 54 56	73 66 84 80	51 59 76 57 68

TABLE B

YEAR-ROUND GLOBAL THERMAL ANALOGUES OF THE CITRUS AREAS OF THE UNITED STATES (Continued)

WARNEST MONTH COOLEST MONTH HUMLDIT Mean Mean Mean Mean Hean °F °F °F °F °F °F °F °F °F 73 82 87 77 62 68 56 79 81 86 80 61 64 58 79 70 82 87 77 66 72 60 76 82 87 76 65 72 59 70 82 87 76 65 76 66 76 66 82 84 75 66 67 66 69 63 76 82 84 79 66 69 63 76 66 82 84 79 66 69 63 76 76	COUNTRY Region PROVINCE Latitude ANNUAL ANNUAL Mean of Country Mean of Country	,								TEMP	F. R. A	MPFRATIRE				AN	ANNUAL
Country	Country	STATION	COUNTRY	Region	PROV INCE	Latitude	¥	NNUAL		╟	WEST	1	2	OLEST	HILINOM	HOH	IDITY
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Florida Southern Sachern 25°30'N 74 79 68 81 86 76 66 72 60 76 Madagascar Southern 25°18'S 76 81 70 82 87 77 66 73 59 70 Mozambque Southern 24°20'S 75 81 69 82 87 76 65 72 58 70 Taiwan Southeastern Sao Paulo 23°56'S 72 76 69 78 82 75 66 70 63 78 Mextern Sinaloa 23°56'S 77 72 82 84 79 66 69 65 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69	Florida Southern 25°30'N 74 79 68 81 86 76 66 72 60 76 Medgascar Southern 22°30'N 76 81 69 87 77 66 73 59 70 Mozambque Southern 24°20'S 75 81 69 82 87 76 65 72 58 72 Taiwan Central Sao Paulo 23°58'N 74 77 70 82 85 78 64 67 61 80 Brazil Southeastern Sinaloa 23°56'S 77 76 69 78 82 75 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66	4 6 P	Ryukyus	Central	Oxfnava	26°12'N	72	75	69	82	86	08	19	99		79	n.a.
ModeSpecial Southern Southern 25°18'S 76 81 70 82 87 77 66 73 59 70 Mozambique Southern Southeastern Sao Paulo 24°20'S 76 69 82 87 76 65 72 58 72 Brazil Southeastern Sao Paulo 23°56'S 76 76 79 82 85 78 64 67 61 80 Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 70 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 66 69 69 69 69 69 69 69 <th< th=""><th>Modestern Southern Sao Paulo 23°11'N 74 81 70 82 87 77 66 73 59 70 Mozambique Southern Southern 24°20's 75 81 69 82 87 76 65 72 58 72 78 76 69 77 65 77 67 67 61 80 78 76 69 76 69 78 76 69 77 66 70 63 78 Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 69 69 69 78</th><th>Romestead</th><th>Florida</th><th></th><th></th><th>25°30'N</th><th>74</th><th>79</th><th></th><th>81</th><th>86</th><th>7.6</th><th>99</th><th>72</th><th></th><th>9/</th><th>09</th></th<>	Modestern Southern Sao Paulo 23°11'N 74 81 70 82 87 77 66 73 59 70 Mozambique Southern Southern 24°20's 75 81 69 82 87 76 65 72 58 72 78 76 69 77 65 77 67 67 61 80 78 76 69 76 69 78 76 69 77 66 70 63 78 Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 69 69 69 78	Romestead	Florida			25°30'N	74	79		81	86	7.6	99	72		9/	09
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Seartil Sao Paulo 23°58'N 74 77 70 82 85 78 64 67 61 80 Brazil Southeastern Sao Paulo 23°56'S 72 76 69 78 82 75 66 70 63 78 Mexico Mestern Sinaloa 23°11'N 74 77 72 82 84 79 66 69 63 76	Seats1 Sao Paulo 23°58'N 74 77 70 82 85 78 64 67 61 80 Brazil Southeastern Sao Paulo 23°56'S 72 76 69 78 82 75 66 70 63 78 Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 63 76	and the second	anbiguezau	Southern		54°20'S	7.5	81	69	82	87	92	65	72	_	72	0.9
Stazil Sautheastern Sao Paulo 23°56'S 72 76 69 78 82 75 66 70 63 78 Mexico Mestern Sinaloa 23°11'N 74 77 72 82 84 79 66 69 63 76	Mexico Western San Paulo 23°56'S 72 76 69 78 82 75 66 70 63 78 Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 63 76	men rengula	197141	Central		23°58'N	7.4	11	20	82	82	78	-2	67		80	72
Mexico Western Sinaloa 23'11'N 74 77 72 82 84 79 66 69 63 76	Mexico Western Sinaloa 23°11'N 74 77 72 82 84 79 66 69 63 76	Sentos	Brazil	Southeastern	Sao Paulo	23°56'S	72	9/	69	78	82	7.5	99	70		7.8	72
		7020C 10n	Mexico	Vestern	Sinaloa	23°11'N	7.4	77	72	82	84	62	99	69		26	74

TABLE 1

PHENOLOGY AND DAY-DEGREE 1/ SUMMATIONS OF GRAPEFRUIT (Marsh Seedless Variety)

Setubal (formerly Palmela), Estremadura P. ovince, Portugal Lat. 38°35'N; Long. 08°53'W; Elev. 23 ft.

		DATESZ/		SUMMATION OF DA	SUMMATION OF DAY-DEGREES (°F.)
Crop	Beginning	Peak of	Beginning	Beginning of Bloom to	Peak of Bloom to
Year	of Bloom	Bloom	of Ripening	Beginning of Ripening	Beginning of Ripening
1948	Mar. 18	Mar. 29	Nov. 20	2,910	778 6
1949	Mar. 30-Apr. 11	Apr. 15		2,915	2,044
1951	Apr. 13	Apr. 20	Dec. 3	2,523	2,023
1953-54	Apr. 13	Apr. 23	Jan. 23	2,812	2,782
1954-55	Apr. 19-Apr. 27	Apr. 19-May.5	Jan. 3	2,569	2,557
1955-56	Mar. 17-Apr. 4	Apr. 6 -Apr. 13	Jan. 7	2,910	2,222
1957-58	Apr. 2 -Apr. 10	Apr. 19-Apr. 22	Jan. 2	2,552	967.6
1960	Mar. 28	Apr. 3	Dec. 5	2,506	767 C
1961-62	Mar. 17	Apr. 4	Mar. 12	3,011	2,942
Mean Standard De Coefficient	Mean Apr. 3 Apr. Standard Deviation	Apr. 13	Dec. 26	2,761 210 7.6	2,713 188 6.9

Source: Based on data of Estacao de Fruticultura, Setubal (formerly Balmela), Portugal.

⁷¹⁷¹

Computed above 55°F. base. Day-degree computations were made on the basis of averages of dates indicated.

TABLE 2

*VERAGE PHENOLOGY, AND DAY-DEGREE 1/ SUMMATIONS FOR GRAPEFRUIT (Marsh Seedless Variety)

Valencia, Spain Lat. 39°29'N; Long. 0°22'N; Elev. 79 ft.

SUMMATION OF DAY-DEGREES (°F.) of Beginning of Ripening Beginning of Ripening	2,774
egitning of Beginning of Blooming Ripening	Apr. 20 Oct. 20

Source: Based on data from Estacion Naranjera de Levante, Burjasot, Spain.

A Translation of the second

1/ Computed above 55°F. base.

TABLE 3

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR GRAPEFRUIT (Marsh Seedless Variety)

Station Experimentale d'Arboriculture, Boufarik, Algeria * Lat. 36°30'N; Long. 3°03'E; Elev. 185 ft.

	DAT	DATES 2/	SUMMATION OF DAY-DEGREES (°F.)
Your Von	o£		Beginning of Blooming to
מינה הבשו	Бтооштик	Kıpenıng	beginning of Kipening
1958	End of April	Oct. 9	2,882
1959	End of April	Oct. 2	2,895
1960	End of April	Oct. 5	2,874
Mean April	April 29	Oct. 8	2,884
Coefficient of Variation (%)	tion (%)		07 • • • • • • • • • • • • • • • • • • •

Source: Based on data of Station Experimentale d'Arboriculture, Boufarik, Algeria.

Computed above 55°F. base. Computed on basis of average of dates shown. À%1+

Approximate coordinates.

TABLE 4

PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR GRAPEFRUIT (Marsh Seedless Variety)

Berri Horticultural Research Station, Berri, South Australia Lat. 34°17'S; Long. 140°38'E; Elev. 215 ft.

			(To) PARCEAULT TO MAY MANAGER
	DATES *	*	SUMMATION OF THE PERMETS
Crop	Beginning of	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
	Gazinoota		700 0
1960-61	Oct. 11	Aug. 3	5,554
1961-62	Oct. 5	July 17	3,10/
1962-63	Oct. 4	Aug. 12	6,913
1963-64	Oct. 4	June 19	7,863
Wean	Oct. 6	July 23	3,054
Standard Deviation Coefficient of Variation (7)	on (Z)		508 6.8

Source: Based on data from the Berri Horticultural Research Station, Berri, South Australia.

 $\frac{1}{2}$ Computed above 55°F. base.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

Northern Hemisphere	October	November	December	January	February		
Southern Hemisphere	April October	May November	June December	July January	August February		
Northern Hemisphere	April	May	June	July	August	September	
Southern Hemisphere		November	December	January	February	March	

AVERAGE PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR GRAPEFRUIT

Sidney, New South Wales, Australia Lat. 33°52'S; Long. 151°12'E; Elev. 138 ft.

		DATES=/	SUMMATION OF DAY-DEGREES (F.)
Variety	Beginning of Blooming	Beginning of Ripening	beginning of blooming to Beginning of Ripening
Marsh Seedless	0ct. 1	Jul. 1	2,966

Source: Based on data from the Department of Agriculture, Sidney, New South Wales, Australia.

- Maturity expressed in terms of mls N/10 Sodium hydroxide required to neutralize 10 mls. juice as applied in N.S.W. However, no standard is prescribed for Grapefruit. Computed above 55°F. base. 1/2
- The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows: *

Northern Hemispher	April	May	June	July	August	September	October	November	December	January
Southern Hemisphere	October	November	December	January	February	March	April	May	June	July

AVERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR GRAPEFRUIT (Marsh Seedless Variety)

Citrusdal, Western Cape Province, South Africa Lat. 32°35'S; Long. 19°01'E; Elev. 494 ft.

DATES 2/		SUMMATION OF DAY-DEGREES (°F.)
Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
2nd week in Sept.	Apr. 15	3,170

Source: Based on data from South African Co-operative Citrus Exchange, Limited, Pretoria, South Africa.

1/ Computed above 55°F. base.

2/ Computed on basis of average of dates shown.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

misphere South	March January July	April February August	May March September	June April October
임	September March	October April	November May	December June

PHENOLOGY AND DAY-DEGREE 1/ SUMMATIONS OF ORANGES (Washington Navel Variety)

Setubal (formerly Palmela), Estremadura Province, Portugal Lat. 38°35'N; Long. 08°53'W; Elev. 116 ft.

		DATES2/		SUM	TATION OF DA	SUMMATION OF DAY-DEGREES (°F.)	F.)
Crop	Beginning	Peak of	Beginning	Beginning of Bloom to	Bloom to	Peak of Bloom to	loom to
Year	of Bloom	ВІоош	or kipening	(A) (B)	(B)	(A)	(A) (B)
1948-49	Mar. 22	Apr. 5	Jan. 6	4,434	2,994	4,292	2,922
1949-50	Apr. 6	Apr. 12	Feb. 15	4,252	2,984	4,168	2,930
1953	Mar. 30	Apr. 10	Dec. 15	4,120	2,848	4,038	2,821
1954	Apr. 19-Apr. 23	Apr. 30-May 5	Nov. 24	3,630	2,545	3,536	2,506
1955	Mar. 25-Apr. 1	Apr. 6 -Apr. 12	Dec. 3	4,146	2,904	4,038	2,848
1957	Apr. 4	Apr. 22	•	3,765	2,560	3,603	2,488
1961	Mar. 26	Apr. 10	Nov. 13	4,088	2,928	3,962	2,877
Mean Standard De Coefficient	Mean Apr. 2 Standard Deviation	Apr. 14	Dec. 19	4,062 261 6.4	2,823 194 6.9	3,948 271 6.9	2,770 196 7.1

Based on data of Estacao de Fruticultura, Setubal (formerly Palmela), Portugal. Source:

7

Column A - computed above 50°F. base. Column B - computed above 55°F. base. Day-degree computations were made on the basis of averages of dates indicated. 7 Mark State of State o

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR ORANGES

Station Experimentale d'Arboriculture, Boufarik, Algeria * Lat. 36°30'N; Long. 3°03'E; Elev. 185 ft.

WASHINGTON NAVEL

	DATES 2/		SUMMATION OF DAY-DEGREES ("F.)
Crop Year	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1958	End of April	Oct. 14	2,932
1959	End of April	Oct. 9	2,972
1960	End of April	Oct. 5	2,874
Wean	April 29	Oct. 9	2,925
Coefficient of Variation (%)		2 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	43 1.5

VALENCIA LATE

VALENCIA LAIR			
	DATES 2/	17	SUMMATION OF DAY-DEGREES (°F.)
Crop Year	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1958	1st week in May	Nov. 19	3,103
1959	1st week in May	Nov. 19	3,258
1960	1st week in May	Nov. 29	3,242
Wean	May 4	Nov. 22	3,201
Coefficient of variation (%)			82 2.6
			المستند والمورس والمراث والمتناء والمستوان والمستوان والمراجع والمستوان والمستوان والمستوان والمستوان والمستوان

Source: Based on data of Station Experimentale d'Arboriculture, Boufarik, Algeria.

Computed above 55°F. base. Computed on basis of average of dates shown. * 121

Approximate coordinates.

PHENOLOGY AND DAY-DECREE SUMMATIONS FOR ORANGES (Washington Navel Variety)

Murrumbidgee Irrigation Area, Griffith, N.S.W., Australia Lat. 34°17'S; Long. 146°03'E; Elev. 429 ft.

Crop Year Beginning of Blooming * 1961-62 Oct. 5 1962-63 Oct. 5 1963-64 Oct. 8	The second secon	SOUTH OF DAL-DEGMES (F.)
		Beginning of Blooming to
	g * Ripening *	Beginning of Ripening
	June 15	3,131
	June 15	2,854
	June 15	2,773
Mean 0ct. 6 Standard Deviation	June 15	2,919 177 6.1

Source: Based on data of Murrumbidgee Irrigacion Area, Griffith, N.S.W., Australia

1/ Computed above 55°F. base.

 $\frac{1}{2}$ Computed on basis of average of dates shown.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

Southern Hemisphere	Northern Hemisphere	Southern Hemisphere	Northern Hemisphere
October	April	March September	September
November	May	April	October
December	June	May	November
January	July		December
February	August		

AVERAGE PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR ORANGES

Sao Paulo Citrus District, Campinas, Brazil *Lat. 22°50'S; Long. 47°15'W; Elev. 2,000 ft.

	** DATES	res2/	SUMMATION OF DAY-DEGREES (°F.)
	Beginning of	Beginning of	Beginning of Blooming to
Variety	Blooming	Ripening	Beginning of Ripening

Washington Navel

Aug.

Mar. - July

2,609

Based on data of USDA Foreign Agricultural Report No. 109, June 1958. Temperature data used are for Sao Paulo, Brazil (Approximate Lat. 23°S; Long. 46°W). Source:

Computed above 55°F. base.

To compute day-degrees from beginning of bloom to beginning of ripening, an average date was used of the first month shown for each period.

Approximate coordinates. The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows: Northern Hemisphere -----September August-----February -----November -----December ----October ------August October-----April December -----June -----July Southern Hemisphere January----February----November----March----April---

-----January

TABLE 11

AVERAGE PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR ORANGES

Urundel and Tabacal Citrus Areas, Argentina *Lat. 22°40'S; Long. 64°W; Elev. 2,000-3,000 ft.

	** DATESZ/		SUMMATION OF DAY-DEGREES (°F.)
	of	Ř	Beginning of Blooming to
Variety	Blooming	Ripening	beginning or Kipening
Valencia	August	Aug Dec.	3,238
Washington Navel	August	Mar. 15 - Apr. 15	2,622

TABLE 12

AVERAGE PHENOLOGY, AND DAY-DEGREE $\frac{1}{2}$ SUMMATIONS FOR ORANGES

*Lat. 23°50'S; Long. 64°50'W; Elev. 2,000-3,000 ft. Ledesma and Calilegua Citrus Areas, Argentina

	**DATESZ		SUMMATION OF DAY-DEGREES ('F.)
Varietv	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
Valencia	August	Aug Dec.	3,238
Washington Navel	August	Mar. 15 - Apr.	2,622

Based on data of USDA Foreign Agriculture Report No. 114, January 1959. Temperalused are those of Salta (Lat. 24'32'S; Long. 66'14'W; Elev. 3,865 ft), Argentina. Source:

Computed above 55°F. base. 15/1

To compute day-degrees from beginning of bloom to beginning of ripening, an average date was used for the first month shown of each period.

Sphere The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as ‡

* Approximate coordinates.

PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR ORANGES (Washington Navel Variety)

Berri Horticultural Research Station, Berri, South Australia Lat. 34°17'S; Long. 140°38'E; Elev. 215 ft.

	DATES	k	SUMMATION OF DAY-DEGREES (F.)
Crop Year	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1958-59	0ct. 3	June 17	3,253
1959-60	Sept. 11	May 26	3,104
1960-61	Sept. 23	June 6	3,432
1961-62	Sept. 29	June 9	3,151
1962-63	Sept. 18	May 23	2,929
MeanStandard DeviationCoefficient of Variation (%)	on (%)	June 4	3,176 167 5.3

Source: Based on data from the Berri Horticultural Research Station, Berri, South Australia.

Computed above 55°F. base. The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as rollows:

Southern Hemisphere Northern Hemisphere	April October	May November	June December	July January	August February	September March
Southern Hemisphere Northern Hemisphere		November May	December June	January July	February August	March September

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR ORANGES (Valencia Late Variety)

Murrumbidgee Irrigation Area, Griffith, N.S.W., Australia Lat. 34°17'S; Long. 146°03'E; Elev. 429 ft.

	DATES 2/		SUMMATION OF DAY-DEGREES (°F.)
Crop Year	Beginning c. Blooming *	Beginning of Ripening *	Beginning of Blooming to Beginning of Ripening
	0ct. 7	Sept.	3,105
1962-63	Oct. 7	Sept.	2,844
Wean	Oct. 7	Sept. 15	2,974

Source: Based on data of Murrumbidgee Irrigation Area, Griffith, N.S.W., Australia

Computed above 55°F. base. Computed on basis of avorage of dates shown.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

Northern Hemisphere	October	May November	December	January	August February	September March
Southern Hemisphere	April	May	June	July	August	September
Northern Hemisphere	April	May	June	July	August	September
Southern Hemisphere	October	November	December	January		March

TABLE 15

PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR ORANGES (Valencia Variety)

Berri Horticultural Research Station, Berri, South Australia Lat. 34°17'S; Long. 140°38'E; Elev. 215 ft.

	DATES *	٠	SUMMATION OF DAY-DEGREES (F.)
Crop Year	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1957-58	0ct. 2	Sept. 17	3,199
1958-59	Oct. 10	Oct. 2	3,332
1959-60	Sept. 14	Sept. 13	3, 107
1960-61	Sept. 30	Sept. 11	3,475
1961-62	Sept. 29	Oct. 15	3,289
1962-63	Sept. 18	Oct. 19	3,247
MeanStandard DeviationCoefficient of Variation (%)	n (%)	Sept. 28	3,275 113 3.5

Source: Based on data from the Berri Horticultural Research Station, Berri, South Australia.

1/ Computed above 55°F. base.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

Southern Hemisphere	Northern Hemisphere	Southern Hemisphere Northern Hemi	Northern Hemisphere
October	April	April	October
November	May	May November	November
December	June	June	December
January	July	July January	January
February	August	August February	February
March	September	September March	March

TABLE 16

AVERAGE PHENOLOGY, AND DAY-DEGREE1/ SUMMATIONS FUR ORANGES

Taranto, Italy Lat. 40°28'N; Long. 17°17'E; Elev. 56 ft.

	Ad	DATES2/	SUMMATION OF DAY-DEGREES ("F.)
	Beginning of	Beginning of	Be inning of looming to
Jariety	Blooming	Ripering	Beginning or Ripening

Dec. 15

1st days of May

Washington Navel

3,469

Source: Based on data from Taranto Experiment Station, Taranto, Italy.

Computed above 55°F. base. Computed on basis of average of dates shown. 15/1

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR ORANGES (Washington Navel Variety)

Mallia, Island of Crete, Greece Lat. 35°18'N; Long. 25°30'E; Elev. 66 ft.

	DATES		SUMMATION OF DAY-DEGREES (F.)
Year Tear	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1960	Apr. 5	0ct. 15	3,724
1961	Apr. 6	Oct. 13	3,625
1962	Apr. 5	Oct. 10	5,5/2
1963	Apr. 5	Oct. 12	3,121
MeanStandard Deviation	n	0ct. 14	3,662
Coefficient of Variation	riation (%)		2.2

Based on phenological data of Experimental Orchard, Mallia, Iraklion District, Island of Crete, Greece. Temperature data used are those of Candia (Lat. 35°20'N; Long. 25°11'E; Flev. 151 ft.), Island of Crete. Source:

 $\underline{1}$ / Computed above 55°F. base.

TABLE 18

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR ORANGES (Washington Navel Variety)

Sidi Mesri Experiment Station, Tripoli, Libya Lat. 32°54'N; Long. 13°11'E; Elev. 72 ft.

	DATES		CITAMATON OF TAX TAX
Crop Year	Beginning of Blooming	Beginning of Ripening	Beginning of Ribening to
1961	Mar. 15	Nov. 20	3,838
1962 1963	Mar. 10 Mar. 17	Nov. 15 Nov. 22	3,987 3,828
Mean	Mar. 14	Nov. 19	3,884
1.1	tion (%)		86 2.2

Source: Based on data of Sidi Mesri Experiment Station, Tripoli, Libya.

A Comment of the Comm

1/ Computed above 55°F. base.

TABLE 19

AVERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR ORANGES

Messina, Sicily, Italy Lat. 38°12'N; Long. 15°33'E; Elev. 167 ft.

	DAT	DATES $\frac{2}{}$	SUMMATION OF DAY-DEGREES (°F.)
Variety	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
Valencia	Middle of March	ond Anril - early May	3 001
Washington Navel	Middle of March	November	
			•

Source: Based on data from Messina Experiment Station, Messina, Sicily, Italy.

15/1

Computed above 55°F. base. Computed on basis of average of dates shown.

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR ORANGES

Rehovot, Coastal Plain, Israel Lat. 31°54'N; Long. 34°49'E; Elev. 214 ft.

VALENCIA VARIETY

	DATES		SUMMATION OF DAY-DEGREES ('F.)
Crop Year	Beginning of Blooming	Beginning of Ripening 27	Beginning of Blooming to Beginning of Ripening
1952	Apr. 1	Mar. 1 - 10	4,797
1953	Apr. 13	Mar. 1 - 10	4,159
1954	Mar. 16	Mar. 1 - 10	4,430
MeanStandard DeviationCoefficient of Variation	n (%)	Mar. 5	4,462 280 6.3

WASHINGTON NAVEL VARIETY

	DATES		SUMMATION OF DAY-DEGREES (°F.)
Your Votes	Beginning of	Beginning of	Beginning of Blooming to
CLOP leaf	Вптшоота	мтреплив	beginning of Kipening
1954	Mar. 10	Oct. 31	3,892
1955	Mar. 5	Nov. 1	3,994
Mean	Mar. 8	Oct. 31	3,943
The state of the s			

University Institute of Agriculture, Rehovot, Israel. Temperature data used are from Lod (Lat. 31°59'N; Long. 34°54'E; Elev. 132 ft.), Israel.
Computed above 55°F. base. Based on data from the Volcani Institute of Agricultural Research, The National and Source:

12/2

Oct. 15 was given as average date of beginning of picking.

TABLE 21

**

PHENOLOGY AND DAY DEGREE 1/ SUMMATIONS OF TANGERINES (Dancy Variety)

Setubal (formerly Palmela), Estremadura Province, Portugal Lat. 38°35'N; Long. 08°53'W; Elev. 116 ft.

		DATES2/		SUMMATION OF DAY-DEGREES	-DEGREES (°F.)
Crop Year	Beginning of Bloom	Peak of Bloom	Beginning of Ripening	Beginning of Bloom to Beginning of Ripening	Peak of Bloom to Beginning of Ripening
1948	Mar. 22	Apr. 5	Dec. 13	2,975	2,903
1949-50	Apr. 8	Apr. 12		2,966	2,930
1951	Apr. 13- Apr. 20	Apr.20 - Apr.27		2,647	2,607
1953	Apr. 13	Apr. 20		2,812	2,791
1954-55	Apr. 1- Apr. 26	May 3 - May 5		2,599	2,518
. 55	Apr. 8- Apr. 12	Apr. 16 - Apr. 20	Nov. 17	2,799	2,743
1957	Apr. 15	Apr. 26	Dec. 14	2,516	2,472
1961	Mar. 28	Apr. 10	Dec. 5	2,956	2,913
Mean Standard I Coefficien	Mean Apr. 8 Standard DeviationCoefficient of Variation (%)	Apr. 19	Dec. 19	2,784 184 6.6	2,735 190 6,9
- 					

Source: Based on data of Estacao de Fruticultura, Setubal (formerly Palmela), Portugal.

Computed above 55°F. base. Day-degree computations were made on the basis of averages of dates indicated. 7121

TABLE 22

PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR TANGERINES (Clementine Variety)

Station Experimentale d'Agrumiculture, San-Giuliano, Corsica, France Lat. 46°N; Long. 7°E; Elev. 155 ft.

	DATES 2/	+	SUMMATION OF DAY-DEGREES (°F.)
Voar	Beginning of	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
1904			
1963	Apr. 20-May 1	Oct. 30	2,847

Source: Based on data of Station Experimentale d'Agrumiculture, San-Giuliano, Corsica.

 $\underline{1}$ / Computed above 55°F. base.

 $\frac{2}{}$ Computed on basis of average of dates shown.

AVERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR TANGERINES (Clementine, Algerian Variety)

Valencia, Spain Lat. 39°29'N; Long. 0°22'W; Elev. 79 ft.

SUMMATION OF DAY-DEGREES ("F.	Beginning of Blooming to Beginning of Ripening	
	Beginning of Ripening	
DATES	Beginning of	

2,936

Nov. 15

Apr. 20

Source: Based on data from Estacion Naranjera de Levante, Burjasot, Spain.

1/ Computed above 55°F. base.

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR TANGERINES

Station Experimentale d'Arboriculture, Boufarik, Algeria * Lat. 36°30'N; Long. 3°03'E; Elev. 185 ft.

CLEMENTINE VARIETY

	DATES 2/		SUMMATION OF DAY-DEGREES (°F.)
	Beginning of	Beginning of	Beginning of Blooming to
Crop Year	Blooming	Ripening	Beginning of Ripening
1958	Apr. 15 - 25	Sept. 23	2,682
1959	Apr. 15 - 25	Oct. 1	2,908
1960	Apr. 15 - 25	Sept. 30	2,850
•			
Mean	Apr. 20	Sept. 28	2,813
Standard Deviation		!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!	$\frac{110}{2}$
Coefficient of Variation (%)	(%)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3.9

DANCY VARIETY

	DATE	DATES $\frac{2}{}$	SUMMATION OF DAY-DEGREES (°F.)
	Beginning of	Beginning of	Beginning of Blooming to
Crop Year	Blooming	Ripening	Beginning of Ripering
1958	Apr. 20 - 30	Nov. 10	3,148
1959	Apr. 20 - 30	Nov. 5	3,250
1960	Apr. 20 - 30	Nov. 10	3,222
			1000
Mean	Apr. 25	Nov. 12	3,20/
Standard Deviation			49 1.5
מספדדדר זכוור מד אמידמרי			

Source: Based on data of Station Experimentale d'Arboriculture, Boufarik, Algeria.

C. T. Harrison of the Control of the

Computed above 55°F. base. Computed on basis of average of dates shown Approximate coordinates. *12/1-

TABLE 25

AVERAGE PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR TANGERINES

Taranto, Italy Lat. 40°28'N; Long. 17°17'E; Elev. 56 ft.

SUMMATION OF DAY-DECREES ('F.)	Beginning of Blooming to Beginning of Ripening	
DATES2/	Beginning of Ripening	
DA	Beginning of	
	Variety	

Clementine

1st days of May

Oct. 24 - 25

3,332

Source: Based on data from Taranto Experiment Station, Taranto, Italy.

1517

Computed above 55°F. base. Computed on basis of average of dates shown.

AVERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR TANGERINES

Stazione Sperimentale Di Agrumicoltura E Fruticoltura, Acireale (Catania) Catania, Sicily, Italy Lat. 37°30'N; Long. 2°36'E; Elev. 215 ft.

	DATES 2	/7	SUMMATION OF DAY-DEGREES (°F.)
Variety	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
Clementine	Middle of March	end Oct early Nov.	3,431

Based on data from Stazione Sperimentale Di Agrumicoltura E Fruticoltura Acireale (Catania), Catania, Sicily, Italy. Temperature data used are for Siracuse (Lat. 37°03'N; Long. 15°18'E; Elev. 76 ft.), Sicily. Computed above 55°F. base. Source:

Computed on basis of average of dates shown. 15/1

A VERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR TANGERINES

Messina, Sicily, Italy Lat. 38°12'N; Long. 15°33'E; Elev. 167 ft.

	DAT	DATES 2/	SUMMATION OF DAY-DEGREES ("F.)
Variotu	Beginning of	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0	G.	
Clementine	Middle of March	end October - early November	3,569

Source: Based on data from Messina Experiment Station, Messina, Sicily, Italy.

 $\frac{1}{2}$ / Computed above 55°F. base. $\frac{2}{2}$ / Computed on basis of average of dates shown.

PHENOLOGY AND DAY-D'GREE SUMMATIONS FOR TANGERINES (Clementine Variety)

Rehovot, Coastal Plain, Israel Lat. 31°54'N; Long. 34°49'E; Elev. 214 ft.

	DATES	ES	SUMMATION OF DAY-DEGREES (°F.)
Crop Year	Beginning of Blooming	Beginning of Ripening 27	Beginning of Blooming to Beginning of Ripening
1952	Apr. 1	Oct. 17	3,876
1953	Apr. 10	Oct. 15	3,627
1954	Mar. 15	Oct. 15	3,595
1955	Mar. 10	Oct. 15	3,685
MeanStandard DeviationCoefficient of Variation	Mar. 25 tion (%)	Oct. 16	3,696 113 3.1

Based on data from the Volcani Institute of Agricultural Research, The National and University Institute of Agriculture, Rehovot, Israel. Temperature data used are from Lod (Lat. 31°59'N; Long. 34°54'E; Elev. 132 ft.), Israel. Source:

Computed above 55°F. base. 77/21

Oct. 15 was giver as average date of beginning of picking.

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AVERAGE PHENOLOGY, AND DAY-DEGREE SUMMATIONS FOR TANGERINES

* Tunis, Tunisia Lat. 36°47'N; Long. 10°12'E; Elev. 66 ft.

	DATE	DATES =/	SUMMATION OF DAY-DEGREES (F.)
Varietv	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
Clementine	Beginning of March	Beginning of November	3,656
Dancy	Middle of March	February - March	3,781

Source: Based on data from Laboratoire d'Arboriculture Fruitiere (INRAT), Tunisia.

1/ Computed above 55°F. base.

2/ Computed on basis of average of dates shown.

Citrus area is northwest and southeast of City of Tunis.

PHENOLOGY AND DAY-DEGREE SUMMATIONS FOR TANGERINES (Clementine Variety)

Sidi Mesri Experiment Station, Tripoli, Libya Lat. 32°54'N; Long 13°11'E; 72 ft. Elev.

	DATES		SUMMATION OF DAY-DEGREES (°F.)
E SOCO	Beginning of	Beginning of	Beginning of Blooming to
	Витшорта	RITHERING	peginning of Kipening
1961	Feb. 25	Nov. 10	3,742
1962	Mar. 2	Nov. 15	4,027
1963	Mar. 10	Nov. 10	3,720
	Z ar 3	Now 12	2 830
•			2,830 165
Coefficient of Variation (%	(%)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4.3

Source: Based on data of Sidi Mesri Experiment Station, Tripoli, Libya.

 $\underline{1}$ / Computed above 55°F. base.

THE STREET

AVERAGE PHENOLOGY, AND DAY-DEGREE $^{1/}$ SUMMATIONS FOR TANGERINES

Concordia Citrus Area, Argentina *Lat. 31°S; Long. 57°W.

	** DATESZ/		SUMMATION OF DAY-DEGREES (°F.)
Variety	Beginning of Blooming	Beginning of Ripening	Beginning of Blooming to Beginning of Ripening
Dancy	Aug Sept.	June - Aug.	3,996

Based on data of USDA Foreign Agriculture Report No. 114, January 1959. Temperature data used are for Salto (Lat. 31°23'S; Long. 57°58'W; Elev. 151 ft.), Urugaay. Salto, Uruguay is located on opposite side of Uruguay River with same latitude. Source:

Computed above 55°F. base

To compute day-degrees from beginning of bloom to beginning of rapening an average date was used for the first month shown for each period. 12/1

Approximate coordinates.

The pertinent counterpart calendar months in the Southern and Northern Hemispheres are as follows:

Northern Hemisphere -----December -----February July-----January September------March October-----April December----June August-----Southern Hemisphere June-----

TABLE 32

MEAN MONTHLY TEMPERATURE DATA *

Setubal, Portugal

Crop Year	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)
1948-49	61	82	61	70	72	73	72	29	62	56	53	56
1949-50	57	79	62	70	73	79	89	65	58	51	20	53
	55	59	61	29	72	70	69	99	59	20	51	64
$1951-52 \frac{1}{2}$	26	9	63	69	71	73	70	65	58	52	51	53
1952-53	57	58	63	69	71	71	29	62	56	53	50	51
1953-54	55	28	6 7	89	73	7.5	71	63	58	53	48	20
1954-55	53	58	7 9	99	72	70	70	29	59	52	26	53
1955-56	24	62	99	69	71	72	72	65	58	55	51	45
1956-57	አ	58 8	65	69	71	7.1	99	65	53	47	95	53
1957-58	28	59	63	99			71	63	26	48	51	54
1958-59	55	28	63	29	72		69	65	26	24	53	64
1959-60	አ	28	62	89	71	71	89	62	55	52	65	52
1960-61	24	61	49	70	72	70	69	09	56	51	50	54
1961-62	59	58	29	7.1	74	77	70	62	27	54	51	52

* Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

1/ Normals

TABLE 33

MEAN MONTHLY TEMPERATURE DATA - NORMALS*

Taranto, Italy

Dec.	(°F.)	51
Nov.	(°F.)	57
Oct.	(°F.)	99
Sept.	(°F.) (°F.) (°F.)	74
Aug.		80
July	(°F.) (°F.) (°F.)	80
June	(°F.)	75
May	(°F.)	29
Apr.	(°F.)	ž
Mar.	(°F.)	52
Feb.	(°F.)	20
Jan.	(°F.)	67

* Temperature data utilized in conjunction with citrus phenology records.

TABLE 34

MEAN MONTHLY TEMPERATURE DATA - NORMALS *

Spain

Locality	Mar.	Apr.	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)
Valencia	26	29	Z	71	75	9/	72	65	58	52	51	52
Malaga	59	61	29	73	77	78	74	29	09	26	24	55
Murcia	59	61	89	74	79	80	9,	29	59	54	23	54
Universidad	82	63	89	77	82	82	77	89	59	53	51	24
Badajoz	55	59	ż	73	78	78	73	79	55	84	47	20

^{*} Temperature data utilized in conjunction with citrus phenology records.

TABLE 35 MEAN MONTHLY TEMPERATURE DATA - NORMALS*

San-Giuliano, Corsica, France

Dec.	(°F.)	50
Nov.	(°F.)	26
Oct.	(°F.)	79
Sept.	(°F.) (°F.) (°F.)	. 72
Aug.		7.7
July	(°F.) (°F.)	92
June	(°F.)	71
May	(°F.)	63
Apr.	(°F.)	28
Mar. Apr.	(°F.)	52
Feb.	(°P.)	67
Jan.	(°F.)	87

^{*} Temperature data utilized in conjunction with citrus phenology records.

TABLE 36

MEAN MONTHLY TEMPERATURE DATA FOR AUSTRALIA *

Berri, South Australia

Crop Year	Sept.	0ct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
	(°F.)	(°F.)	(.k.)		(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)
1957-58	36	63	89	74	74	74	69	7 9	09	67	50	53
1958-59	5 5	62	70	69	82	74	72	7 9	55	52	20	56
1959-60	58	62	72	89	77	71	73	62	54	20	20	51
1960-61	26	7 9	\$	77	80	75	71	65	57	54	51	52
1961-62	09	99	89	74	9/	73	71	61	54	52	20	51
1962-63	56	62	89	73	73	73	70	61	57	53	50	52
1963-64	29	65	89	73	72	71	89	62	56	52	:	1 100

Griffith, N.S.W., Australia

Crop Year	Oct	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	July Aug.	Sept.
	(°F.)	(°F.)	(°F.)	(°F.) (°F.)		(°F.)	(°F.)	(°F.)	(°F.) (°F.) (°F.) (°F.) (°F.) (°F.) (°F.)	(°F.)	(°F.)	(°F.)
1961-62 1962-63 1963-64	68 63 63	70 67 67	74 72 73	75 74 71	72 73 72	70 72 69	61 60 63	52 57 52	52 49 49	 48 	50	55 55

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

MEAN MONTHLY TEMPERATURE DATA - NORMALS *

d'Azaguie, Ivory Coast Africa

Dec.	3.)	0	
	(°F.)	80	
Nov.	(°F.)	80	
Oct.	(°F.)	80	
Aug. Sept. Oct.	(°F.) (°F.) (°F.) (°F.) (°F.) (°F.)	78	
Aug.	(°F.)	76	
July	(°F.)	78	
June	(°F.)	78	
May	(°F.)	80	
Apr.	(°F.)	8.1	
Jan. Feb. Mar. Apr.	(°F.) (°F.) (°F.)	81	
Feb.	(°F.)	78	
Jan.	(°F.)	79	

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

MEAN MONTHLY TEMPERATURE DATA *

Algeria	a
Boufarik,	Afri

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1958	(°F.) 51 51	(°F.) 51 56	(°F.) 59 58	(°F.) 61 58	(°F.) 64 65	(°F.) 71 74	(°F.) 78 76	(°F.) 79 79	(°F.) 76 75	(°F.) 65 66	(°F.) 57 59	(°F.) 56 55
1960 - (Norm	860 - (Normals) 49	52	99	09	65	72	7.7	78	75	99	59	54

Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

TABLE 38

MEAN MONTHLY TEMPERATURE DATA FOR YEARS 1961- 1963 *

Sidi Mesri, Tripoli, Libya

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	July Aug. Sept. Oct.	Oct.		Dec.
	(°F.)	(°F.) (°F.) (°F.)	(°F.)	(°F.)								
1961	ĸ	25	26	65	70	73	7.7	9/	73	69	99	57
1962	55	አ	99	65	70	72	78	9/	9/	71	63	54
1963	55	26	55	62	\$	7.5	62	62	78	29	64	61

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

TABLE 39

MEAN MONTHLY TEMPERATURE DATA - NORMALS *

Loudima, Congo Brazzaville

Oct.	(°F.)	82
Aug. Sept. Oct.	(°F.)	80
Aug.	(°F.)	75 76
July	(°F.)	75
June	(°F.)	76
May	(°F.)	80
Apr.	$(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$	82
Mar.	(°F.)	83
Feb.	(°F.)	82
Jan.	(°F.)	83
Nov. Dec.	(°F.)	83
Nov.	(°F.)	83

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

MEAN MONTHLY TEMPER TURE DATA - NORMALS *

Citrusdal, Western Cape Province, South Africa

İ		
Dec.	(°F.)	75
Nov.	(°F.)	69
Oct.	(°F.)	63
Sept. Oct.	(°F.) (°F.) (°F.) (°F.) (°F.) (°F.)	28
	(°F.)	54
July Aug.	(°F.)	24
June	(°F.)	. 24
May	(°F.)	28
April	(°F.)	65
Feb. Mar. April	(°F.)	72
Feb.	(°F.) (°F.) (°F.)	74
Jan.	(°F.)	75

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

TABLE 40

MEAN MONTHLY TEMPERATURE DATA FOR YEARS 1960 - 1963 *

Candia, Island of Crete, Greece

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	(°F.)	(°F.)										
1960	55	59	57	62	70	9/	80	81	75	74	99	09
1961	55	53	28	65	71	76	79	79	73	89	89	61
1962	57	አ	61	3	71	77	80	9/	92	69	89	58
1963	28	82	27	63	89	78	80	82	77	69	7 9	61

Messara District, Island of Crete, Greece

n. Feb. Mar. Apr. May (°F.) (°F.) (°F.) (°F.) (55 57 62 72 51 57 64 71 51 58 59													
(°F.) (°F.) (°F.) (°F.) 53 55 57 62 72 53 51 57 64 71 54 51 58 64 71	ı. G	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
53 55 57 62 72 53 51 57 64 71 54 51 58 62 71		(°F.)	(°P.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.) (°F.)	(°F.)
53 54 54 61 68	60 61 63 63	ន្តន្តន	55 51 54	57 58 54	62 64 61	72 71 71 68	78 78 80 78	83 84 85 85	86 83 84 86	76 75 78 78	74 67 68 69	65 57 65 62	59 57 55 57

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

MEAN MONTHLY TEMPERATURE DATA FOR ARGENTINA *

Bella Vista, Argentina

Crop Year Aug. Sept. Oct.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Mar. Apr. May	May	June	July
	(°F.)	(°F.) (°F.) (°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.) (°F.)	(°F.)
1960-61	63	89	71	9/	80	82	82	62	72	99	62	62
1960-62	63	39	71	9/	80	79	78	9/	57	58	59	51
1962-63	59	99	29	77	86	81	79	78	9/	65	61	7 9
1963	63	99	69	71	9/	: •	1	1	!	:	i	;
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^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

MEAN MONTHLY TEMPERATURE DATA - NORMALS*

Argentina

Locality	Aug.	Sept. Oct.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)	(°F.)
Salta Santiago del Estero Corrientes Buenos Aires Posadas	56 63 52 64	63 68 55 66	66 73 71 60 70	69 78 76 66	70 880 72 78	71 83 82 74 79	71 81 82 73 78	69 77 79 70 76	64 70 72 62 69	58 63 66 56 65	55 56 62 49 62	54 57 62 50 60

^{*} Temperature data utilized in conjunction with citrus phrnology records.

^{1/} Normals for years 1960 and 1961.

TABLE 42

MEAN MONTHLY TEMPERATURE DATA FOR 1952 - 1955 *

Lod, Israel

(°F.)	Feb. (°F.)	Mar. (°F.)	Apr.	May (°F.)	June	July	Aug.	Sept.	0ct.	Nov.	Dec.
	58 55 59	58 56 60 59	, 64 60 60 64	70 69 68	75 75 74 76	77 80 78 78	80 80 80 78		(F.) 74 72 72	(f.) 65 62 66 65	63 54 57 58

MEAN MONTHLY TEMPERATURE DATA - NORMALS *

Kibbutz Ha'chorshim, Israel

Dec.	(°F.)	63
Nov.	(°F.)	69
Oct.	(°F.)	7.7
Sept.	(°F.)	77 61
Aug.	(°F.)	82
July Aug. Sept. Oct. Nov. Dec.	(°F.)	80
	$(^{\circ}F)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$ $(^{\circ}F.)$	77
Apr. May June	(°F.)	73
Apr.	(°F.)	29
Mar.	(°F,)	61
Jan. Feb. Mar	(°F.)	57
Jan.	(°F.)	09

^{*} Temperature data utilized in conjunction with citrus phenology records covering the same period of years.

TABLE 43

MEAN MONTHLY TEMPERATURE DATA - NORMALS*

Station	Jan.	Feb.	Feb. Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
	°F.)	(°F.)	(°F.) (°F.) (°F.) (°F.	(°F.)								
Siracuse, Sicily, Italy 51	51	52	55	09	99	72	78	62	74	89	09	54
Messina, Sicily, Italy 53	53	24	99	09	99	72	79	80	92	89	62	26
Tunis, Tunisia	20	52	26	09	99	74	79	80	92	89	09	52

Temperature data utilized in conjunction with citrus phenology records.

MEAN MONTHLY TEMPERATURE DATA - NORMALS*

TABLE 44

Station	Jan.	Feb.	Feb. Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
	(°F.)	(°F.)	(°F.) (°F.) (°F.) (°F.	(°F.)								
Sidney, N.S.W., Australia	72	72	70	79	59	54	53	99	59	79	29	70
Sao Paulo, Brazil	7.1	71	70	99	62	09	58	61	63	65	29	69
Salto, Uruguay	62	7.7	73	65	09	55	54	57	09	65	7.1	9/

^{*} Temperature data utilized in conjunction with citrus phenology records.